

What we claim is:

1. A method of producing an analyte ion, comprising
providing a substrate having a non-porous rough surface;
contacting an analyte with said non-porous rough surface whereby said analyte
interacts with said non-porous rough surface; and
exposing said non-porous rough surface to an energy source to produce a ionized
gas phase analyte.
2. A method according to claim 1, wherein said contacting of said analyte with said
non-porous rough surface occurs in situ with said exposing said non-porous rough surface to an
energy source.
3. A method according to claim 2, wherein the analyte contacting the non-porous
rough surface is a gaseous analyte.
4. A method according to claim 3, wherein the contacting of the gaseous analyte
occurs by means of either a gas injector or as a gas stream directed towards said non-porous
rough surface.
5. A method according to claim 1, wherein said non-porous rough surface has sub-
micrometer surface features.

6. A method according to claim 5, wherein said sub-micrometer surface features are smaller than about 0.1 μm .

7. A method according to claim 1, wherein said non-porous rough surface has a surface roughness of between about 10 nm and about 1 μm .

8. A method according to claim 1, wherein the substrate comprises at least one member of the group consisting of silicon, carbon, and polymers.

9. A method according to claim 8, wherein the substrate is single crystal silicon.

10. A method according to claim 8, wherein the substrate is highly oriented pyrolytic graphite.

11. A method according to claim 1, wherein said non-porous rough surface is supported on low heat conductivity material.

12. A method according to claim 1, further comprising a step of roughening the surface of the substrate using a surface roughening treatment.

13. A method according to claim 12, wherein said surface roughening treatment comprises at least one member selected from the group consisting of etching with reactive chemicals, bombardment with hyperthermal reactive atoms, bombardment with high-energy particles, irradiation with lasers, exposure to a plasma, vapor deposition, and roughening with mechanical action.

14. A method according to claim 1, further comprising a step of analyzing a physical property of the ionized gas phase analyte.

15. A method according to claim 14, wherein said analysis is performed by means of at least one member selected from the group consisting of mass spectrometry, ion mobility spectrometry, and a current measurement device.

16. A method according to claim 1, further comprising a step of cooling the substrate prior to contacting the analyte with the non-porous rough surface.

17. A method according to claim 1, further comprising a step of adding a matrix to the non-porous rough surface.

18. A method according to claim 17, wherein the matrix is at least one member selected from the group consisting of water, glycerol, and acetic acid.
19. A method according to claim 17, wherein the addition of the matrix to the non-porous rough surface occurs by adsorption of gas phase matrix material.
20. A method according to claim 17, wherein the addition of the matrix to the non-porous rough surface occurs in situ with exposing the non-porous rough surface to an energy source.
21. A method according to claim 1, wherein the analyte is a gaseous eluate from a gas chromatograph.
22. A method according to claim 1, wherein the analyte is obtained from ambient air.
23. A method according to claim 1, wherein said non-porous rough surface is irradiated with light of a wavelength absorbed by either of the non-porous rough surface or a matrix added to the non-porous rough surface.
24. A method according to claim 1, wherein the method is performed under ambient pressure.

25. A method according to claim 1, wherein said energy source is a laser.

26. A method according to claim 25, wherein said laser repeatedly pulses said non-porous rough surface with laser light, and the contacting of the analyte to the non-porous rough surface occurs during and between the laser pulses.

27. A device for generating analyte ions comprising
substrate having a non-porous rough surface;
means for exposing an analyte to the non-porous rough surface whereby the
analyte interacts with the non-porous rough surface; and
energy source to supply energy at the non-porous rough surface to generate
ionized gas phase analyte.

28. A device according to claim 27, wherein said non-porous rough surface is
structured to interact with the analyte.

29. A device according to claim 28, wherein said non-porous rough surface is
structured to promote the adsorption of the analyte on said surface.

30. A device according to claim 28, wherein said non-porous rough surface is structured to promote the formation of ionized analyte on said surface.

31. A device according to claim 28, wherein said non-porous rough surface is structured to promote the desorption of ionized gas phase analyte from said surface.

32. A device according to claim 27, wherein said non-porous rough surface has sub-micrometer surface features.

33. A device according to claim 32, wherein said sub-micrometer surface features are smaller than about 0.1 μm .

34. A device according to claim 27, wherein the substrate comprises at least one member of the group consisting of silicon, carbon, and polymers.

35. A device according to claim 34, wherein the substrate is single crystal silicon.

36. A device according to claim 34, wherein the substrate is highly oriented pyrolytic graphite.

37. A device according to claim 27, wherein said non-porous rough surface is supported on low heat conductivity material.

38. A device according to claim 27 further comprising means for determining a physical property of the ionized gas phase analyte.

39. A device according to claim 38, wherein said means is at least one member selected from the group consisting of mass spectrometry, ion mobility spectrometry, and a current measurement device.

40. A device according to claim 27, wherein said means for exposing an analyte comprises either a gas injector or a gas stream directed towards said non-porous rough surface.

41. A method of producing an analyte ion comprising
providing a substrate;
contacting a gaseous analyte with the substrate; and
exposing the substrate to irradiation to produce an ionized gas phase analyte,
wherein said contacting occurs in situ with said exposing.

42. A method according to claim 41, wherein the contacting of the gaseous analyte occurs by means of either a gas injector or as a gas stream directed towards said substrate.

43. A method according to claim 41, further comprising a step of analyzing a physical property of the ionized gas phase analyte.

44. A method according to claim 43, wherein said analysis is performed by means of at least one member selected from the group consisting of mass spectrometry, ion mobility spectrometry, and a current measurement device.

45. A method according to claim 41, further comprising a step of cooling the substrate prior to contacting the analyte with the substrate.

46. A method according to claim 41, further comprising a step of adding a matrix to the substrate.

47. A method according to claim 46, wherein the matrix is at least one member selected from the group consisting of water, glycerol, and acetic acid.

48. A method according to claim 46, wherein the addition of the matrix to the substrate occurs by adsorption of gas phase matrix material.

49. A method according to claim 46, wherein the addition of the matrix to the substrate occurs in situ with exposing the substrate to an energy source.

50. A method according to claim 41, wherein the analyte is a gaseous eluate from a gas chromatograph.

51. A method according to claim 41, wherein the analyte is obtained from ambient air.

52. A method according to claim 41, wherein said substrate is irradiated with light of a wavelength absorbed by either of the substrate or a matrix added to the substrate.

53. A method according to claim 41, wherein the method is performed under ambient pressure.

54. A method according to claim 41, wherein said energy source is a laser.

55. A method according to claim 54, wherein said laser repeatedly pulses said substrate with laser light, and the contacting of the analyte to the substrate occurs during and between the laser pulses.